

REMARKS

Claims 1-57 remain pending in the present application. Clarifying amendments have been made to independent claims 1, 15, 30, 37, 45 and 52 to more particularly recite the unique and novel features for the embodiments of the present invention. Reconsideration and allowance for all of the claims in the present application as amended are earnestly solicited in view of the following remarks.

The drawings stand objected in view of some of the drawings being hand drawn with hand written references. However, drawings are acceptable if the drawings are readable and reproducible for examination purposes regardless as to whether they are hand written or hand drawn. It is respectfully submitted that the drawings in the present application are readable and reproducible and are therefore acceptable for examination purposes. Accordingly, it is respectfully submitted that the objection to the drawings be reconsidered and withdrawn. If this objection is maintained, it is respectfully requested that the Examiner specifically describes the drawings and references that require clarification.

Claims 1, 15, 30, 37, 45, and 52 stand objected as the amendments to these claims are considered to be non-compliant because they do not include markings showing the changes relative to the last entered amendment. Claims 1, 15, 30, 37, 45 and 52 are presently amended to include markings showing changes relative to the last entered amendment filed on February 2, 2004. Accordingly, it is respectfully submitted that the claim informalities have been overcome and it is respectfully requested that the objection to the claims be reconsidered and withdrawn.

Claims 1, 3, 4, 10, 11, 15, 17-19, 24, 30, 32, 33, 37, 39, 40, 45, 48, 49 and 52 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,751,002 to Ogata et al. in view of U.S. Patent No. 6,242,750 to Takahashi et al., claims 5, 13, 14, 20, 27-29, 34, 41, 42, 46, 47 and 53-55 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ogata et al. in view of Takahashi et al. in further view of U.S. Patent No. 5,399,871 to Ito et al., claims 2, 6, 16, 31 and 38 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ogata et al. in view of Takahashi et al. in further view of Ito et al. in further view of U.S. Patent No. 5,747,936 to Harrison et al., claims 7, 8, 12, 21, 22, 26, 35, 43, 50 and 56 stand rejected under 35 U.S.C.

§103(a) as being unpatentable over Ogata et al. in view of Takahashi et al. in further view of U.S. Patent No. 4,276,477 to Enge et al., and claims 9, 23, 36, 44, 51 and 57 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Ogata et al. in view of Takahashi et al. in further view of U.S. Patent No. 5,343,047 to Ono et al. These rejections are respectfully traversed.

Independent claims 1, 14, 30, 37, 45 and 52 have been amended to recite that the implanter and methods are directed to delivering low energy, monoenergetic ion beams to an ion implantation target. For example, the ions may be accelerated to energies of about 0.2 to 80 keV according to an embodiment of the present invention. The claims have been further amended to recite that the first voltage may be adjustable and the second or final voltage is generated to an energy that is sufficient for transport without excessive beam expansion. For instance, the first voltage may be from about 0.2 to 80 kV and the second voltage may be adjusted to provide a negative transport voltage up to -30kV. Specifically, independent claims 1, 30 and 45 are directed to implanters and methods for decelerating the ion beam to a final energy that is lower than the first transport energy downstream from an analyzer. Thereby, neutral particles are separated before the low energy, monoenergetic ion beam is delivered to the target without excessive beam expansion. Independent claims 15, 37 and 52 are directed to ion implanters and methods for implanting ions in a double deceleration mode of operation. The first deceleration stage decelerates the ion beam to a second transport energy less than a first transport energy and then separates the neutral particles from the ion beam and transports the ion beam through a beam filter. The ion beam is then decelerated a second time before reaching the final energy that is less than the second transport energy before reaching the target so that a low energy, monoenergetic ion beam is delivered to the target without excessive beam expansion.

Ogata et al. is relied upon to disclose an ion implantation apparatus which includes an ion source 1, a mass analyzer 2, quadru-pole electro-magnets 11 and 12, electrode assemblies 5 and 8, a deflection electro-magnet 6 and a target substrate 10. The electrode assembly 5 includes electrodes 5a, 5b, and 5c interposed between insulators I. As acknowledged in this rejection, Ogata et al. do not disclose a deceleration stage positioned downstream of the analyzer for decelerating the ion beam from the first transport energy to a final energy lower than the first transport energy.

Takahashi et al. is therefore relied upon to disclose an ion implantation device including an ion source 2, a mass analyzer magnet 6, a beam guide 7, and electrode apertures 10, 11, and 12. The electrode apertures 10, 11, and 12 provide the deceleration and convergence effect so that a large current of a low energy beam can be implanted into a wafer. However, Takahashi et al. fail to disclose an ion implanter for generating a low energy, monoenergetic ion beam that is transported without excessive beam expansion as recited in the claims of the present application. Accordingly, it is respectfully submitted that independent claims 1, 15, 30, 37, 45, and 52 and their respective dependent claims 3, 4, 10, 11, 17-19, 24, 25, 30, 32, 33, 39, 40, 45, 48 and 49 patentably define over the combination of Ogata et al. and Takahashi et al. and it is respectfully requested that this rejection be reconsidered and withdrawn.

Dependent claims 2, 5-9, 12-14, 16, 20-23, 26-29, 31, 34-36, 38, 41-44, 46, 47, 50, 51, and 53-57 are directed to additional embodiments of the present invention based on their respective independent claims 1, 15, 30, 37, 45, and 52. The further documents relied upon in these rejections fail to cure the deficiencies as discussed above in the rejection to their base claims. Particularly, none of the documents cited in these rejections suggest or imply generating a low energy, monoenergetic ion beam which is delivered to a target by transport without excessive beam expansion as recited in the claims. Accordingly, it is respectfully requested that these rejections be reconsidered and withdrawn.

In view of the above stated reasons and amendments, it is respectfully submitted that all of the outstanding objections and rejections have been overcome. Accordingly, it is requested that claims 1-57 of the present application be passed to issue. If any issues remain unresolved, the Examiner is requested to telephone the undersigned attorney. Please charge any additional fees or credit any overpayments to deposit account No. 50-0896.

Respectfully submitted,
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